WHAT IS CLAIMED IS:

1. A method for manufacturing an optical member of a fluoride crystal, comprising:

a growing step of growing an ingot of a fluoride crystal;

a cutting-out step of cutting out from the ingot a cylindrical basic material with two parallel planes which have a certain crystal plane orientation;

an orientation-determining step of determining a crystal orientation of a side surface of the cylindrical basic material;

a birefringence-measuring step of measuring birefringence in a specific crystal axis direction at the side surface determined based on the crystal orientation determined in the orientation-determining step; and

an evaluating step of evaluating the fluoride crystal on the basis of a result of measurement of the birefringence.

2. The method for manufacturing an optical member of a fluoride crystal according to claim 1, wherein, in the orientation-determining step, the crystal orientation at a side surface is determined by measuring the birefringence at the side surface at a plurality of angles.

3. The method for manufacturing an optical member of a fluoride crystal according to claim 1, wherein, in the evaulating

step, a determination is made as to whether or not a maximum value of the birefringence in the specific crystal axis direction at the side surface is not more than 10 nm/cm at a measurement wavelength of 633 nm.

4. The method for manufacturing an optical member of a fluoride crystal according to claim 3, wherein when the maximum value of the birefringence in the specific crystal axis direction at the side surface is not more than 10 nm/cm at the measurement wavelength of 633 nm, the basic material is formed into a shape of a predetermined optical member.

5. The method for manufacturing an optical member of a fluoride crystal according to claim 3, wherein the two parallel planes are {111} planes, and the specific crystal direction at the side surface is <110> direction.

6. The method for manufacturing an optical member of a fluoride crystal according to claim 3, wherein the two parallel planes are {100} plane, respectively, and the specific crystal direction at the side surface is <100> direction or <110> direction.

7. An optical member of a fluoride crystal manufactured by the manufacturing method defined in claim 1, wherein a maximum

value of the birefringence in a specific crystal axis direction at a side surface of the fluoride crystal, which is shaped in a cylindrical shape with two parallel planes having a specific crystal plane orientation, is not more than 10 nm/cm at a measurement wavelength of 633 nm.

8. The optical member of a fluoride crystal according to claim 7, wherein the specific crystal plane orientation is {111}, and the specific crystal axis direction at the side surface is <110> direction.

9. The optical member of a fluoride crystal according to claim 7, wherein the specific crystal plane orientation is {100}, and the specific crystal axis direction at the side surface is <100> direction or <110> direction.

10. The optical member of a fluoride crystal according to claim 7, wherein the fluoride crystal is a calcium fluoride single crystal.

11. An exposure apparatus including an optical system comprised of the optical member defined in claim 7.